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similar light hydrocarbon, it could readily be changed into illuminating gas. When this gas burns, no sulphur compounds are given off, and the products of the combustion would be only carbon dioxide (CO_2) and water. This process would only be of value where cobs were very cheap and abundant. If it were possible to heat the retort by means of the cob charcoal, or some other waste material, this would diminish the expense.

By burning the cobs in an open stove, it was found that they would yield a little over one per cent. of ash. This ash on analysis contained the following substances:

| | <i>Per cent.</i> | | <i>Per cent.</i> |
|-----------------------------------|------------------|--------------------------|------------------|
| Silica and insoluble residue..... | 38.13 | Sulphuric anhydride..... | 1.40 |
| Alumina..... | 2.02 | Chlorine..... | .57 |
| Ferric oxide..... | 3.91 | Sodic carbonate..... | 2.59 |
| Phosphoric anhydride..... | 5.27 | Potassic carbonate..... | 38.65 |
| Calcic oxide..... | 1.71 | Moisture and carbon..... | traces. |
| Magnesian oxide..... | 2.18 | | |

The valuable materials in this ash are the phosphoric anhydride and the potassic carbonate. One thousand pounds of cobs would therefore yield ten pounds of ash, which would contain about one-half a pound of phosphoric anhydride, and three and eight-tenths pounds of potash. Ordinary wood contains from four-tenths to three and nine-tenths pounds of potash per one thousand pounds. Corn-stalks are very rich, containing seventeen and one-half pounds per thousand.

IS THE ALKALOIDAL STRENGTH OF TEA AN INDEX OF ITS COMMERCIAL VALUE ?

BY PROF. L. E. SAYRE,
Department of Pharmacy, Kansas State University.

It will be seen from the title of this paper that the following chemical assay of some of the tea of the market was made with a view of ascertaining, if possible, the relation between alkaloidal strength and commercial value.

The popular belief is that the higher-priced teas are stronger in *theine* (alkaloid) than the cheaper grades. The following figures will serve to show the truth or fallacy of this belief.

For examination, eleven samples were selected, representative of some of the different brands upon the market. They were as follows:

| | | | |
|------------------------|------------------|--------------------------|------------------|
| 1. Formoso Oolong..... | 90 cents per lb. | 7. Imperial..... | 65 cents per lb. |
| 2. Formoso Oolong..... | 60 " " " | 8. Gunpowder..... | 70 " " " |
| 3. Japan..... | 70 " " " | 9. Gunpowder..... | 50 " " " |
| 4. Japan..... | 25 " " " | 10. Tea dust, green..... | 20 " " " |
| 5. Young Hyson..... | 70 " " " | 11. Tea dust, dark..... | 20 " " " |
| 6. Young Hyson..... | 40 " " " | | |

Ten grams of the powdered leaf were mixed intimately with two grams of calcined magnesia; the mixture, coarsely powdered, was treated with 100 cc. of boiling distilled water. The boiling was continued five minutes. The whole was transferred to a percolator, and the residue percolated with 50 cc. of boiling distilled water. The dregs were then returned to the beaker and boiled again with 100 cc. of water; transferred to a percolator, and then percolated until exhausted. The percolate was then evaporated on a water-bath to about 20 cc., and transferred to a separator. The alkaloid (*theine*) was then washed from this concentrated percolate by means of chloroform, using three or four portions of 25 cc., each successively, (the last washing leaving upon evaporation no residue.) The washings were then mixed and

evaporated, and the residue, consisting of nearly pure theine, was dried and weighed. The results obtained were as follows:

| | | |
|------------------------------------|------|------------------|
| No. 1, at 90 cents per pound | 2.73 | per cent. theine |
| " 2, " 60 " " " | 3.67 | " " " |
| " 3, " 70 " " " | 3.10 | " " " |
| " 4, " 25 " " " | 2.14 | " " " |
| " 5, " 70 " " " | 2.69 | " " " |
| " 6, " 40 " " " | 2.49 | " " " |
| " 7, " 65 " " " | 2.53 | " " " |
| " 8, " 70 " " " | 3.05 | " " " |
| " 9, " 50 " " " | 2.12 | " " " |
| " 10, " 20 " " " | 2.09 | " " " |
| " 11, " 20 " " " | 2.21 | " " " |

It would appear from the foregoing that there is no fixed relation between the commercial value of tea and its alkaloidal strength. A tea, for example, at 20 cents per pound, has more alkaloid present than one at 50 cents per pound; and one at 90 cents per pound has less of theine represented than one selling at 60 cents per pound. From a *medical* point of view, this determination is of practical value, for, contrary to the general belief, physiologically considered, a tea (being valuable only in the proportion of alkaloid present) is valuable or not regardless of commercial consideration.

THE QUALITY OF COMMERCIAL PEPPERS.

BY PROF. L. E. SAYRE,
Department of Pharmacy, Kansas State University.

There seems to be a wide difference of opinion as to the extent of adulteration of ground spices. Some hold that it is a difficult matter to obtain a pure spice in common use as condiment, and others, equally good authorities, hold that, when ordinary care is used in purchasing, it will be found that adulteration is the exception rather than the rule.

To determine which of these two views is the correct one, will require much more time than I have been able to give to the subject; but I have made examination of a number of samples of the most familiar and largely used of all condiments—black pepper—with a view of contributing something in this direction. Accordingly, ten samples were obtained in open market, care being taken to not duplicate brands, and to get a fair average of pepper from different sources sold in the retail stores. These were all subjected to the same process of analysis.

Before stating the result, it may be well to say that in the examination special stress was laid upon the amount and character of the fixed residue, remaining after the evaporation of an ethereal percolate.

It is well known that an ethereal percolate of ground pepper contains in solution, almost wholly, *volatile oil*, *resin*, and the alkaloid *piperine*.

It may also be known that the evaporated residue (the fixed residue) contains resin and piperine, the volatile oil having escaped during evaporation.

The determination of ash and moisture is desirable, but not to be depended upon as a method of estimating value. An excess of ash would indicate, possibly, sand or earthy matter, but starch could not be detected by incineration. As to the determination of moisture, no reliance need be placed upon the determination of this constituent, for pure pepper may vary greatly in this respect, containing from 12 to 9 per cent. of water.

As stated previously, I have laid more stress upon the evaporated ethereal extract, believing this data to be a surer index of power, taken by itself, than any other. I